

REMARKS

In the Final Office Action¹, the Examiner:

- a) rejected claims 2, 14, 21, and 22 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Application Publication No. 2002/0084513 to Siniaguine ("Siniaguine") in view of U.S. Patent Application Publication No. 2002/0115226 to Mikawa et al. ("Mikawa");
- b) rejected claims 5 and 8 under 35 U.S.C. § 103(a) as being unpatentable over Siniaguine and Mikawa in view of U.S. Patent Application Publication No. 2002/0190375 to Mashino et al. ("Mashino");
- c) rejected claims 4, 6, 7, 9, 13, 15, 23, and 24 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Application Publication No. 2003/0210534 to Swan et al. ("Swan") in view of Mikawa and further in view of Mashino;
- d) rejected claims 10 and 12 under 35 U.S.C. § 103(a) as being unpatentable over Swan, Mikawa, and Mashino and further in view of U.S. Patent Application Publication No. 2001/045605 to Mayashita et al. ("Mayashita");
- e) rejected claim 11 under 35 U.S.C. § 103(a) as being unpatentable over Siniaguine and Mikawa in view of Mayashita; and
- f) rejected claims 16-20 under 35 U.S.C. § 103(a) as being unpatentable

¹ The Final Office Action contains a number of statements reflecting characterizations of the related art and the claims. Regardless of whether any such statement is identified herein, Applicant declines to automatically subscribe to any statement of characterization in the Final Office Action.

over Siniaguine/Swan, Mikawa, and Mashino in view of U.S. Patent No. 6,166,425 to Sakao ("Sakao").

I. **35 U.S.C. § 103(a) rejection of claims 2, 14, 21, and 22**

Applicant respectfully traverses the rejection of claims 2, 14, 21, and 22 under 35 U.S.C. § 103(a) as being unpatentable over Siniaguine in view of Mikawa. A *prima facie* case of obviousness has not been established.

To establish a *prima facie* case of obviousness, the prior art taken separately or in combination must teach or suggest all the claim limitations. See M.P.E.P. § 2142, 8th Ed., Rev. 5 (August 2006). Moreover, "in formulating a rejection under 35 U.S.C. § 103(a) based upon a combination of prior art elements, it remains necessary to identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed." USPTO Memorandum from Margaret A. Focarino, Deputy Commissioner for Patent Operations, May 3, 2007, page 2.

A *prima facie* case of obviousness has not been established because, among other things, Siniaguine and Mikawa, taken alone or in combination, do not teach or suggest each and every element of Applicant's independent claim 2. For example, Siniaguine fails to teach or suggest a semiconductor device including "a through plug formed to have a side surface being in contact with the diffusion layer patterns, the side surface [of the through plug] being surrounded by the diffusion layer patterns," as recited in claim 2 (emphasis added).

The Examiner apparently asserts that the combination of elements 140/150/160 corresponds to the claimed "through plug" and that layer 140 being in contact with the source drain regions 204 corresponds to the claimed "side surface." See Final Office

Action, page 2. The Examiner then admitted that Siniaguine "does not teach that the source/drain regions are formed of a plurality of diffusion layer patterns formed on the semiconductor substrate; an insulation film formed between the diffusion layer patterns on the semiconductor substrate." Final Office Action, page 3.

Notwithstanding the Examiner's assertions and admissions, Applicant notes that Siniaguine instead discloses a method of manufacturing a integrated circuit that includes dielectric layer 140, conductive layer 150, filler 160, and source drain regions 204. See Siniaguine, Figure 5. Siniaguine merely teaches that the combined elements 140/150/160 are formed on only one side of the source drain regions 204. See *Id.* Accordingly, Siniaguine does not teach or suggest "a through plug formed to have a side surface being in contact with the diffusion layer patterns, the side surface [of the through plug] being surrounded by the diffusion layer patterns," as recited in claim 2 (emphasis added).

Mikawa fails to cure the deficiencies of Siniaguine. As pointed out in the Amendment filed on March 19, 2007, Mikawa merely teaches that a contact plug 14 is formed within intermediate isolation film 13 between lower electrode 15 and heavily doped diffusion layers 11a. See Mikawa, Figure 1. In addition, the contact plug 14 taught by Mikawa is formed above diffusion layer 11a and, therefore, is also not surrounded by diffusion layer 11a. Therefore, Mikawa also fails to teach or suggest "a through plug formed to have a side surface being in contact with the diffusion layer patterns, the side surface [of the through plug] being surrounded by the diffusion layer patterns," as recited in claim 2 (emphasis added).

For at least the reason that the cited references fail to teach each and every element recited in claim 2, no *prima facie* case of obviousness has been established.

Claim 2 is therefore allowable. Dependent claims 14, 21, and 22 are also allowable at least by virtue of their dependence from allowable base claim 2. Therefore, Applicant requests that the 35 U.S.C. § 103(a) rejection be withdrawn.

II. **35 U.S.C. § 103(a) rejection of claims 5 and 8**

Applicant respectfully traverses the rejection of claims 5 and 8 under 35 U.S.C. § 103(a) as being unpatentable over Siniaguine and Mikawa in view of Mashino. A *prima facie* case of obviousness has not been established.

Claims 5 and 8 depend from claim 2 and require all of the elements recited in claim 2. As discussed above, Siniaguine and Mikawa both fail to teach or suggest a semiconductor device including "a through plug formed to have a side surface being in contact with the diffusion layer patterns, the side surface [of the through plug] being surrounded by the diffusion layer patterns," as recited in claim 2, and required by claims 5 and 8 (emphasis added). Mashino fails to cure the deficiencies of Siniaguine and Mikawa.

Mashino is cited by the Examiner for allegedly teaching "a pattern portion formed above the semiconductor element formation layer comprising copper wherein the through plug is partly surrounded also by the pattern portion above the semiconductor element formation layer." Final Office Action, page 4. Such alleged teachings, even if combinable with Siniaguine and Mikawa, fail to cure the noted deficiencies of Siniaguine and Mikawa. That is, Mashino also fails to teach or suggest a semiconductor device including "a through plug formed to have a side surface being in contact with the

diffusion layer patterns, the side surface [of the through plug] being surrounded by the diffusion layer patterns," as recited in claim 2, and required by claims 5 and 8 (emphasis added).

For at least the reason that the references, whether taken alone or in combination, fail to teach or suggest each and every element of independent claim 2, which are required by claims 5 and 8, a *prima facie* case of obviousness cannot be established with respect to these claims. Claims 5 and 8 should therefore be allowable. Accordingly, Applicant respectfully requests that the Examiner withdraw the rejection of claims 5 and 8 under 35 U.S.C. § 103(a).

III. 35 U.S.C. § 103(a) rejection of claims 4, 6, 7, 9, 13, 15, 23, and 24

Applicant respectfully traverses the rejection of claims 4, 6, 7, 9, 13, 15, 23, and 24 under 35 U.S.C. § 103(a) as being unpatentable over Swan in view of Mikawa and further in view of Mashino. A *prima facie* case of obviousness has not been established.

A *prima facie* case of obviousness has not been established because, among other things, the cited references, taken alone or in combination, do not teach or suggest each and every element of Applicant's independent claim 7. Claim 7 calls for a combination including, for example:

... an insulation film formed between the diffusion layer patterns on the semiconductor substrate to isolate the diffusion layer patterns from one another . . . [and]

... a though plug formed to have a side surface being in contact with the insulation film . . . (emphasis added).

Swan fails to teach at least these elements of claim 7. Swan instead discloses that the insulation film 32 on the substrate 12 is an interlayer dielectric film that insulates

metallization layers 34 from each other. See Swan, figure 5. Swan, however, does not teach the claimed "diffusion layer patterns" and specifically the claimed forming "an insulation film . . . between the diffusion layer patterns on the semiconductor substrate to isolate the diffusion layer patterns from one another," as recited in claim 7 (emphasis added).

The Examiner contends that Swan teaches an "insulation film [32]" and "a through plug formed to have a side surface being in contact with the insulation film (Fig. 5, through plug comprising 48/62/64)." Final Office Action, page 5. Swan, however, teaches that element 48, associated by the Examiner with the combination of elements 62 and 64 to comprise a "through plug," is an oxide. Accordingly, Swan does not teach an "insulation film formed between the diffusion layer patterns . . . [and] a through plug formed to have a side surface being in contact with the insulation film," as recited in claim 7 (emphasis added). Instead, Swan merely teaches independent alternating dielectric film 32 is formed in contact with oxide 48. Mikawa and Mashino do not cure the deficiencies of Swan, for similar reasons as those discussed above with respect to claim 2.

Further, Applicant notes that Swan discloses a through plug 48/62/64 surrounded by the interlayer dielectric film 32 that insulates metallization layers 34 with each other and, therefore, the interlayer dielectric film 32 does not have any relationship with the diffusion layers. In other words, Swan's insulation film 32 is quite different from Mikawa's insulation film 12, and they are not interchangeable.

Independent claim 9, although of different scope, contains similar limitations to those highlighted above for claim 7 and, therefore, is also patentable over the cited

references. For at least the reason that the cited references fail to teach each and every element recited in claims 7 and 9, no *prima facie* case of obviousness has been established. Claims 7 and 9 are therefore allowable. Dependent claims 4, 6, 13, 15, 23, and 24 are also allowable at least by virtue of their respective dependence from allowable base claim 7 or 9. Therefore, Applicant requests that the 35 U.S.C. § 103(a) rejection be withdrawn.

IV. 35 U.S.C. § 103(a) rejections of claims 10-12 and 16-20

With respect to the remaining § 103(a) rejections listed above, specifically, with respect to claims 10-12 and 16-20, Applicant submits that Mayashita and Sakao also fail to cure the deficiencies of Siniaguine, Swan, Mikawa, and Mashino. For example, neither Mayashita nor Sakao teach or suggest a "through plug" and, accordingly, cannot teach a through plug as recited in independent claims 2, 7, or 9. Accordingly, Mayashita and Sakao fail to cure the deficiencies of Siniaguine, Swan, Mikawa, and Mashino, already discussed above with respect to claims 2, 7, and 9.

Claims 10-12 and 16-20 respectively depend from claim 2, 7, or 9, and therefore require all of the elements recited in their respective base claim. Consequently, no *prima facie* case of obviousness has been established over claims 10-12 and 16-20. Claims 10-12 and 16-20 should therefore be allowable. Therefore, Applicant requests that the remaining § 103(a) rejections be withdrawn.

V. **CONCLUSION**

In view of the foregoing remarks, Applicant respectfully requests reconsideration and reexamination of this application and the timely allowance of the pending claims.

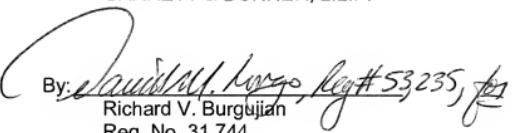
The arguments presented herein do not raise new issues beyond responding to the Final Office Action, and do not necessitate the undertaking of any additional search of the art by the Examiner. Therefore, this Request for Reconsideration after Final should allow for immediate and favorable action.

Please grant any extensions of time required to enter this response and charge any additional required fees to Deposit Account 06-0916.

Respectfully submitted,

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